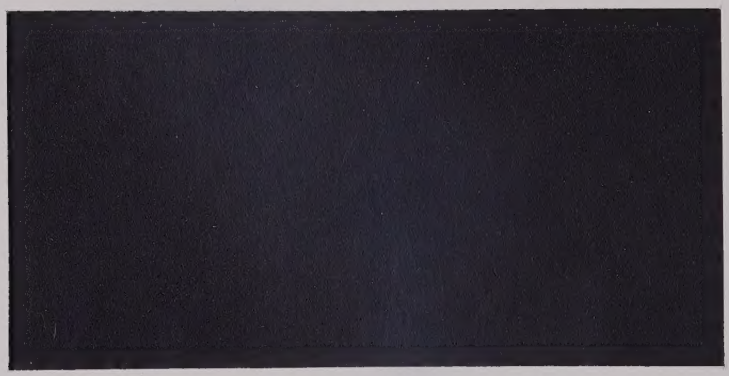
OPERATING MANUAL

CCITT G.703 8448 kb/s DATA INTERFACE (MODEL 30524) OPERATING MANUAL

Telecommunications Techniques Corporation

A DYNATECH COMPANY

. . . EXPECT EXCELLENCE



STRATIC

IMPORTANT

Please return the enclosed card so TTC may ensure that product updates, application notes, and new product information reaches the users of our equipment.

ML10706
Rev. B

CCITT G.703 8448 kb/s DATA INTERFACE (MODEL 30524) OPERATING MANUAL

FEBRUARY 1991

©Telecommunications Techniques Corporation 1989

TELECOMMUNICATIONS TECHNIQUES CORPORATION
20410 Observation Drive
Germantown, MD 20876 USA
(301) 353-1550 Fax (301) 353-0731

TABLE OF CONTENTS

SECTION		PAGE
1.0	**GENERAL INFORMATION**	**1**
1.1	INTRODUCTION	1
1.2	INTERFACE OVERVIEW	1
1.3	INTERFACE FEATURES	1
1.4	INTERFACE COMPATIBILITY	1
1.5	OPTIONS AND ACCESSORIES	1
2.0	**INTERFACE DESCRIPTION**	**3**
2.1	INTRODUCTION	3
2.1	PHYSICAL DESCRIPTION	3
2.2	FUNCTIONAL DESCRIPTION	3
3.0	**INTERFACE INSTALLATION, SETUP, AND OPERATION**	**5**
3.1	INTRODUCTION	5
3.2	FIREBERD 6000	5
3.3	FIREBERD 4000	7
4.0	**INTERFACE SPECIFICATIONS**	**11**
4.1	INTRODUCTION	11
5.0	**MAINTENANCE AND SERVICE**	**13**
5.1	INTRODUCTION	13
5.2	MAINTENANCE	13
5.3	SERVICE	13
A-1	**APPENDIX**	**15**

FIGURES

2-1	CCITT G.703 8448 kb/s DATA INTERFACE	3
3-1	FIREBERD 6000 CCITT G.703 8448 kb/s DATA INTERFACE MENU	6
3-2	FIREBERD 4000 CCITT G.703 8448 kb/s DATA INTERFACE MENU	9

TABLES

3-1	FIREBERD 6000 G.703 8448 kb/s DATA INTERFACE REMOTE COMMANDS	7
3-2	FIREBERD 4000 G.703 8448 kb/s DATA INTERFACE REMOTE COMMANDS	10
4-1	CCITT G.703 8448 kb/s DATA INTERFACE SPECIFICATIONS	11
A-1	REVISION F REMOTE CONTROL COMMANDS	15

GENERAL INFORMATION

1.1 INTRODUCTION

This manual contains information on Telecommunications Techniques Corporation's (TTC) CCITT G.703 8448 kb/s Data Interface (Model 30524). This information is divided into sections on: general information; interface description; installation and set-up; mainframe set-up; interface specifications; and service information.

1.2 INTERFACE OVERVIEW

The CCITT G.703 8448 kb/s Data Interface allows a FIREBERD mainframe to test communications equipment and systems that conform to the interface specification in Section 7 of CCITT Recommendation G.703. The G.703 signals are serial, return-to-zero (RZ) pulses with High Density Bipolar Three (HDB3) encoding. This interface operates with the 75-ohm "preferred solution" of Recommendation G.703.

In order to conform with CCITT Recommendation O.151 for a 2^{15}-1 pseudorandom pattern, all data leaving the interface is inverted, with respect to the "normal". This causes each logic 1 generated by the FIREBERD to be transmitted as a logic 0 (Space) and each logic 0 to be transmitted as a logic 1 (Mark).

1.3 INTERFACE FEATURES

The CCITT G.703 8448 kb/s Data Interface has the following features.

- Accepts low-level degraded signals, regenerates the signal, and recovers the clock timing from the data.
- Terminates or bridges G.703 circuits.
- Performs error analysis based on either bit errors or coding violations.
- Detects High Density Bipolar 3 (HDB3) coding violations in the received data.
- Provides an 8.448 MHz oscillator.

1.4 INTERFACE COMPATIBILITY

The CCITT G.703 8448 kb/s Data Interface is designed in accordance with and meets the following recommendation.

- CCITT G.703

1.5 OPTIONS AND ACCESSORIES

There are no manufactured cables available from TTC for the CCITT G.703 8448 kb/s Data Interface, since the mating connector is a BNC connector which is readily available from many sources.

INTERFACE DESCRIPTION

2.1 INTRODUCTION

The CCITT G.703 8448 kb/s Data Interface is a menu-controlled interface. This section describes the interface connectors and controls, the interface functions, the timing sources, and the self-loop test.

2.2 PHYSICAL DESCRIPTION

The CCITT G.703 8448 kb/s Data Interface measures 7.3 inches (185 mm) wide, 1.5 inches (38 mm) high, and 5.1 inches (130 mm) deep. Two spring-tensioned screws secure the interface module to the FIREBERD Communications Analyzer rear panel. Connector pins on the interface module mate with the mainframe's connector receptacle when the interface panel is flush with the mainframe rear panel.

Depending on the type of testing being performed, either bridged or terminated impedance is selected. Figure 2-1 illustrates the CCITT G.703 8448 kb/s Data Interface panel. BNC connectors provide the transmit (TX) and receive (RX) inputs.

Three toggle switches provide the interface hardware controls. The following paragraphs describe these interface controls. When this interface is installed in the FIREBERD 6000 or FIREBERD 4000, all of these switches are under software control and can be set and reset by the mainframe front panel controls.

TIMING Switch - This two-position toggle switch selects the source of the timing clock. In the XTAL (crystal) position, the crystal oscillator on the interface becomes the transmit timing source. With this switch set to the RECOV (recovered) position, the interface uses the clock recovered from the incoming G.703 data as the transmit timing source.

MODE VIOLATION Switch - This two-position toggle switch selects the bit error detection mode. With this switch set to the NORM position, the FIREBERD detects normal Bipolar Violations (BPVs). Setting this toggle switch to the VIOLATION position selects the HDB3 coding violation detection mode.

IMPEDANCE Switch - This two-position toggle switch determines the interface input impedance. With this toggle switch set to the TERM position, the input impedance is 75 ohms. In the BRIDGE position, the interface input impedance is 1000 ohms or greater.

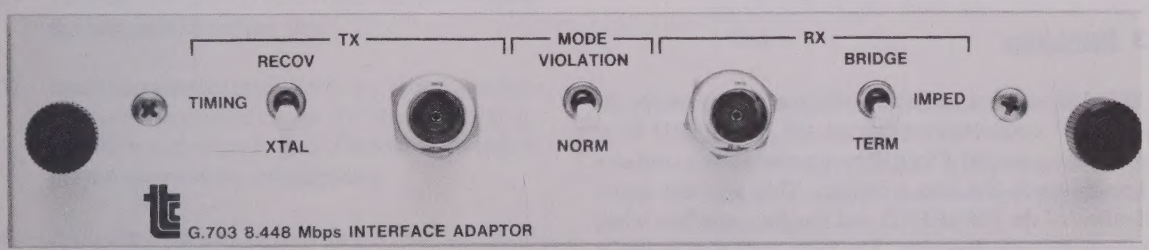


Figure 2-1
CCITT G.703 8448 kb/s Data Interface

2.3 FUNCTIONAL DESCRIPTION

The CCITT G.703 8448 kb/s Data Interface allows the FIREBERD Communications Analyzer to test communications systems which conform to the 8.448 Mb/s digital channel service.

2.3.1 Error Analysis

This interface performs two types of error analysis:

- Bit error analysis.
- HDB3 code violation analysis.

During code violation detection, the interface searches for High Density Bipolar 3 (HDB3) or Alternate Mark Inversion (AMI) code violations.

2.3.2 Timing Sources

On the FIREBERD 6000, four clock timing sources can be selected: (1) the clock recovered by the interface from the incoming G.703 signal; (2) the interface crystal, which can provide a timing reference at or around 8.448 MHz; or (3) the external BNC input, or (4) the FIREBERD mainframe synthesizer. Selection of the timing source is made by pressing the FIREBERD 6000 front panel pushbutton switch labeled GEN CLK. Repeatedly pressing this pushbutton scrolls through its three selections (SYNTH, INTF, or BNC).

Selection of the timing source on the FIREBERD 4000 is made by pressing the SETUP CATEGORY rocker switch until the LED next to the GENERATOR CLOCK label is illuminated. The three softkey pushbutton switches above the SETUP panel are used to select the INTRNL, INTF, or BNC timing source.

2.3.3 Self-Loop

This data interface includes a relay that is activated by the SELF LOOP pushbutton switch on the FIREBERD front panel. Pressing the SELF LOOP pushbutton switch connects the line driver to the line receiver. This provides quick verification of the FIREBERD and the data interface when performing bit error detection. The input and primary output connections do not need to be removed during the test, since complete isolation is provided by the relay when testing in the Self-Loop mode.

NOTE: Do not set the generator clock (GEN CLK pushbutton switch on the FIREBERD 6000 or the GENERATOR CLOCK on the FIREBERD 4000) to the INTF position or use the RECOV timing source during the Self-Loop mode.

The NORM mode should be selected when performing the self-loop test. If BPV is selected, operation of the FIREBERD appears the same as if NORM had been selected. The ability of the violation circuitry to detect coding violations is not checked, since no coding violations are generated in the loop-test.

INTERFACE INSTALLATION, SET-UP, AND OPERATION

3.1 INTRODUCTION

This section is divided into two major parts. Each part describes the interface installation, set-up, and operating procedures for the FIREBERD 6000 and FIREBERD 4000 mainframes, respectively. Refer to the appropriate FIREBERD User's Guide for additional information.

3.2 FIREBERD 6000

The following sections describe installation, set-up, and operation of this interface for a FIREBERD 6000 mainframe.

3.2.1 Interface Installation

The following procedure describes the steps for installing the interface in a FIREBERD 6000 mainframe.

CAUTION: Turn the AC power OFF before installing the interface module in the FIREBERD mainframe.

(1) Ensure that the POWER switch is in the OFF position on the FIREBERD mainframe front panel.

(2) Turn the FIREBERD mainframe around to expose the rear panel interface slot.

(3) Insert the interface module into the vacant interface slot, with the printed circuit (PC) board facing up. The PC board edges fit into slides on either side at the top edges of the interface slot.

(4) Press the interface module firmly into the mainframe mating connector, until the interface faceplate is flush with the mainframe rear panel.

(5) Secure the interface in the mainframe by turning the two screws on the interface front panel clockwise, until finger tight.

3.2.2 FIREBERD 6000 Mainframe Set-Up

The following steps outline the procedure for setting up a FIREBERD 6000 mainframe after the interface installation is complete.

(1) With the CCITT G.703 8448 kb/s Data Interface installed, turn the AC power on by pressing the front panel POWER switch to its ON position.

(2) Connect the G.703 signal source to the desired interface panel RECEIVER connector.

(3) Press the DATA pushbutton switch to select the desired data pattern. A data pattern is selected when the LED is illuminated next to the data pattern label. Refer to the FIREBERD 6000 User's Guide for a description of the different data patterns available and their uses.

(4) Press the GEN CLK pushbutton to select the signal timing source for use during the test. Selecting a signal timing source other than SYNTH requires an external clock source from either the network or another source.

(5) Setting the TIMING MODE is not necessary with the CCITT G.703 8448 kb/s Data Interface installed.

(6) Press the MENU pushbutton to illuminate the LED next to the INTF SETUP label. The message: **INTERFACE: XXXXXX** is displayed on the top line and the available interfaces are displayed on the bottom line.

(7) Press the 8MG703 softkey to select the 8448 kb/s G.703 Data Interface. Pressing this softkey displays: **INTERFACE: 8MG703** on the top line and the first three menu selections (**TIME, MODE,** and **IMPED**) on the bottom line.

(8) Once the desired menu parameter is visible in the display, press the corresponding softkey to change the interface operating parameter. Refer to Section 3.2.3 for a description of the menus and selections available.

(9) After the interface parameters are set as desired, press the ENTER key to display the interface top level menu (**INTERFACE: 8MG703**).

(10) Press the MENU pushbutton to select other criteria required for the test to be performed.

(11) Set the other front panel controls (ANALYSIS RESULTS, ANALYSIS MODE, PRINTER, etc.) as required for the test to be performed.

(12) Press the SELF LOOP pushbutton switch to perform the self-test on the mainframe and installed interface.

3.2.3 Interface Set-Up

This section describes the interface selections available, after the mainframe has been configured. The CCITT G.703 8448 kb/s Data Interface is selected through the FIREBERD front panel and may be controlled either by the FIREBERD front panel or by the interface front panel switches.

Once in the 8MG703 interface menu, pressing the up arrow key displays the next higher menu level. Pressing the ENTER key displays the interface selection top level (home) menu. Figure 3-1 illustrates the CCITT G.703 8448 kb/s Data Interface menu.

The following paragraphs list each menu, along with a description of the selections available.

TIME

XTAL - Selects the interface crystal oscillator as the transmit timing source.

RECOV - Selects the received G.703 signal clock as the timing source.

NOTE: This selection should not be used when the FIREBERD is in a self-loop test.

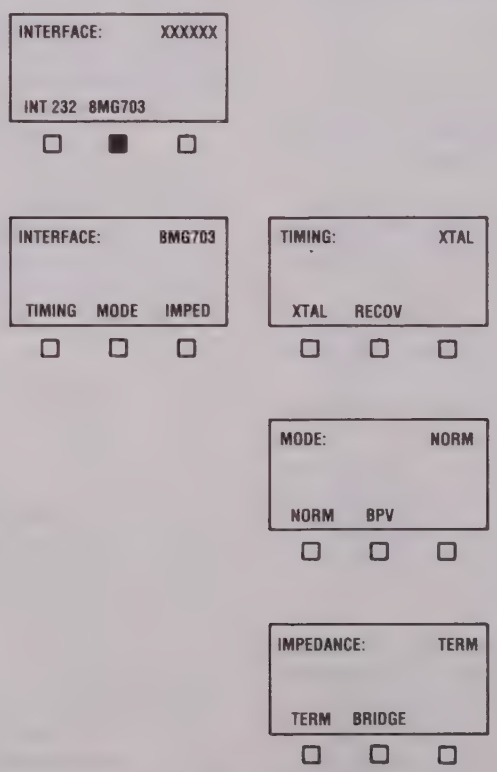


Figure 3-1
FIREBERD 6000 CCITT G.703 8448 kb/s Data Interface Menu

NOTE: The BPV selection should not be used during the FIREBERD self-loop test.

IMPED

BRIDGE - Sets the interface input impedance to 1000 ohms or greater.

TERM - Sets the interface input impedance to 75 ohms.

3.2.4 FIREBERD 6000 Interface Remote Control

Using the built-in RS-232 interface or the optional IEEE-488 interface, the FIREBERD 6000 mainframe can be remotely controlled. The Remote Control Commands Handbook describes the mainframe remote control capabilities.

Only the remote control commands specific to this interface are included in Table 3-1. Also note that these commands are used with a FIREBERD 6000 with at least Revision G software. Remote control commands that support Revision F software or lower are contained in Appendix A of this manual.

If the CCITT G.703 8448 kb/s interface is installed in the FIREBERD 6000's rear panel, issue the following command prior to using the commands listed in Table 3-1:

>INTF:SELECT EXT

If the CCITT G.703 8448 kb/s interface is installed in an ISU-6000, specify the ISU and slot numbers as follows:

>INTF:SELECT:ISU 1,3

EXAMPLE: The CCITT G.703 8448 Interface is in ISU #1, Slot #3.

3.3 FIREBERD 4000

The following sections describe installation, set-up, and operation of this interface in a FIREBERD 4000 mainframe.

3.3.1 Interface Installation

CAUTION: Turn the AC power OFF before installing the interface module into a FIREBERD mainframe.

(1) Ensure the POWER switch is in the OFF position on the FIREBERD mainframe front panel.

(2) Turn the FIREBERD mainframe around to expose the rear panel interface slot(s). The FIREBERD

Table 3-1
FIREBERD 6000 G.703 8448 kb/s Data Interface Remote Commands

Remote Command	Result
INTF:8MG703:TIMING?	Displays the transmit timing reference.
INTF:8MG703:TIMING XTAL	Selects the interface crystal oscillator as the transmit timing reference.
INTF:8MG703:TIMING RECOV	Selects the recovered timing mode as the transmit timing reference.
INTF:8MG703:RESULT_MODE?	Displays the error detection mode.
INTF:8MG703:RESULT_MODE NORMAL	Selects the normal bit error detection mode.
INTF:8MG703:RESULT_MODE BPV	Selects the HDB3 error detection mode.
INTF:8MG703:INPUT?	Displays the interface input impedance.
INTF:8MG703:INPUT TERM	Selects the 75-ohm interface input impedance.
INTF:8MG703:INPUT BRIDGE	Selects the 1000-ohm interface input impedance.

4000 may have two interface slots, if Option 4001 (optional interface) is installed. Slot 1 (the bottom slot) is standard and Slot 2 (the top slot) is optional.

(3) Insert the interface module into the vacant interface slot, with the printed circuit (PC) board facing up. The PC board edges fit into slides on either side at the top edges of the interface slot.

(4) Press the interface module firmly into the mainframe mating connector, until the interface faceplate is flush with the mainframe rear panel.

(5) Secure the interface in the mainframe by turning the two screws on the interface front panel clockwise, until finger tight.

3.3.2 FIREBERD 4000 Mainframe Set-Up

The following steps outline the procedure for setting up the FIREBERD 4000 mainframe after installation of the interface is complete.

(1) With the G.703 8448 kb/s Data Interface installed, turn the AC power ON by pressing the rear panel POWER switch to the ON position.

(2) Connect the G.703 signal source to the rear panel RECEIVER connector.

(3) Press the SETUP CATEGORY rocker switch to select the desired data pattern. The data pattern selected is indicated by illuminating the LED next to the PATTERN label. The first three data patterns are displayed on the bottom line of the display. Pressing the MORE pushbutton switch displays additional data patterns. The selected data pattern is visible after **PATTERN:** in the display. Refer to the FIREBERD 4000 User's Guide for a description of the different data patterns available and their uses.

(4) Press the SETUP CATEGORY rocker switch to illuminate the LED next to the label GENERATOR CLOCK to select the signal timing source for use during the test.

(5) The front panel displays **GEN CLOCK: XXXXXX** on the top line and displays the menu choices on the bottom line. Selecting the BNC signal timing source requires an external clock source from either the network or another source. If the interface menu is set to INTF, the interface TIMING toggle switch may be used to select between XTAL and RECOV timing.

(6) Press the SETUP CATEGORY rocker switch to illuminate the LED next to the INTERFACE label. The message: **INTERFACE: XXXXXX** is displayed on the top line and a list of available interfaces is displayed on the bottom line.

(7) Press the 8MG703 softkey to select the CCITT G.703 8448 kb/s Data Interface. Pressing this softkey displays: **INTERFACE: 8MG703** on the top line. Pressing the right SETUP SELECT switch allows the first menu to be displayed on the screen. Repeatedly pressing the right SETUP SELECT switch scrolls through the menus and back to the top level (home) menu. Refer to Figure 3-2 for the FIREBERD 4000 G.703 8448 kb/s Data Interface menu.

(8) Once the desired menu parameter is visible in the display, press the corresponding softkey to change the interface operating parameter. Refer to Section 3.3.3 for a description of the menus and selections available.

(9) After the interface parameters are set as desired, press the HOME key to display the interface top level menu (**INTERFACE: 8MG703**) or continue pressing the SETUP SELECT switch to scroll through the other interface parameters.

(10) Press the SETUP CATEGORY rocker switch to set or verify other criteria required for the test that is to be performed. Pressing the SETUP CATEGORY rocker switch to illuminate the LED next to the SETUP SUMMARY label displays the selected test pattern, interface, clock frequency, and the two most significant interface parameters.

(11) Set the other front panel controls (RESULT SELECT, CATEGORY, PRINTER, etc.) as required to configure the mainframe for the test to be performed.

(12) Press the SELF LOOP pushbutton switch to perform the self-test on the mainframe and installed interface.

3.3.3 Interface Set-Up

This section describes the interface selections available, after the mainframe has been configured. The CCITT G.703 8448 kb/s Data Interface is selected and controlled by the FIREBERD 4000 front panel.

The following paragraphs describe the interface menus and menu selections available.

TIME

XTAL - Selects the interface crystal oscillator as the transmit timing source.

RECOV - Selects the received G.703 signal clock as the timing source.

NOTE: The RECOV selection should not be used when the FIREBERD is in a self-loop test.

MODE

NORM - Selects the bit error detection mode. In this mode, the FIREBERD detects bit errors.

CODE - Selects the HDB3 code violation mode. In this mode, the FIREBERD detects HDB3 coding violations.

NOTE: The CODE selection should not be used during the FIREBERD self-loop test.

IMPED

BRIDGE - Sets the interface input impedance to 1000 ohms or greater.

TERM - Sets the interface input impedance to 75 ohms.

3.3.4 FIREBERD 4000 Interface Remote Control

Using the built-in RS-232 interface or the optional IEEE-488 interface, the FIREBERD mainframe can be remotely controlled. The Remote Control Commands Handbook describes the mainframe remote control capabilities.

Only the remote control commands specific to this interface are included in Table 3-2. For additional information concerning remote control of the FIREBERD mainframe, refer to the Remote Control Commands Handbook.

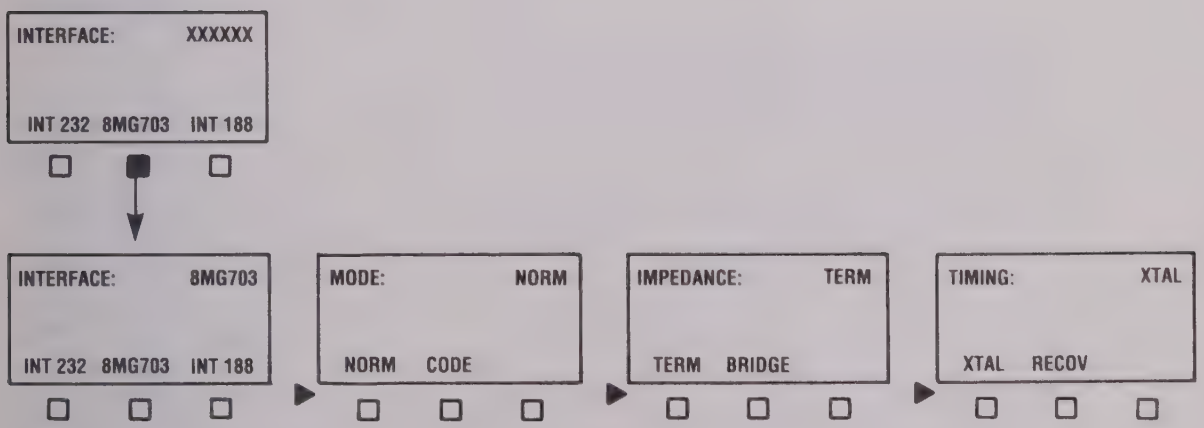


Figure 3-2
FIREBERD 4000 CCITT G.703 8448 kb/s Data Interface Menu

Table 3-2
FIREBERD 4000 G.703 8448 kb/s Data Interface Remote Commands

Remote Command	Result
INT SET	Displays the active interface
INT SEL SLOT 1	Selects the interface in slot 1
INT SEL SLOT 2	Selects the interface in slot 2
INT SET 8MG703 TIM XTA	Selects the interface crystal oscillator as the interface timing reference
INT SET 8MG703 TIM REC	Selects the recovered timing mode as the interface timing reference
INT SET 8MG703 MOD NOR	Selects the normal bit error detection mode
INT SET 8MG703 MOD BPV	Selects the HDB3 error detection mode
INT SET 8MG703 IMP TER	Selects the 75-ohm interface input impedance
INT SET 8MG703 IMP BRI	Selects the 1000-ohm interface input impedance

The INT SET commands provide full remote control of the 8448 kb/s G.703 Data Interface. INT SET displays the selected datinterface, but does not change the currently active interface in the FIREBERD mainframe.

INTERFACE SPECIFICATIONS

4.1 INTRODUCTION

This section contains the interface specifications for the CCITT G.703 8448 kb/s Data Interface. This information is listed in Table 4-1.

Table 4-1
CCITT G.703 8448 kb/s Data Interface Specifications

Item	Specification
General	
Operating Bit Rate:	8448 kb/s typical, ±1.0 kb/s.
Coding:	HDB3 (High Density Bipolar with 3 Zero Substitution). AMI (Alternate Mark Inversion).
Connectors:	BNC. TX Jack: signal on inner conductor, shield is grounded. RX Jack: signal on inner conductor, shield is grounded.
Drivers	
Pulse Shape:	Conforms to CCITT Recommendation G.703.
Typical Peak Mark Voltage:	2.37 V ±10%, into 75 ohms.
Peak Space Voltage:	0 V ±0.24 V, into 75 ohms.
Typical Pulse Width:	59 nanoseconds.
Ratio of Positive-to-Negative Pulse Amplitudes at Midpoint:	0.95 to 1.05.
Ratio of Positive-to-Negative Pulse Widths at Half-Amplitude:	0.95 to 1.05.

Table 4-1
CCITT G.703 8448 kb/s Data Interface Specifications (Continued)

Item	Specification
Receivers	
Input Impedance, Term:	75 ohms with 20 dB return loss, minimum.
Input Impedance, Bridge:	1000 ohms, minimum.
Sensitivity:	0 dB to -6 dB, typical signal.
Operating Bit Rate:	8448 kb/s ±100 ppm.
Crystal Oscillator	
Frequency:	8448 kHz.
Accuracy and Stability:	±30 ppm, 0 to 50° Celsius.

MAINTENANCE AND SERVICE

5.1 INTRODUCTION

This section contains information on maintenance and service for the CCITT G.703 8448 kb/s Data Interface, including TTC's warranty policies and repair procedures.

5.2 MAINTENANCE

5.2.1 In Case of Difficulty

If the unit totally fails to operate after installing the interface in a FIREBERD mainframe, (i.e., no panel indicators light), check the following items:

- Verify that the supply line voltage is present.
- Verify that the AC line cord is supplying the line voltage to the mainframe.
- On the FIREBERD mainframe, verify the proper line voltage selection.
- On the FIREBERD mainframe, verify the fuse is not blown and that it is correct for the supplied line voltage.
- Verify the interface is properly seated into the mainframe.

If some of the indicators light but the unit fails to operate, verify that the interface installed is the correct type and that it is properly installed. Be sure to turn the power off before trying to remove or reseat the interface. If another interface module is available, turn off the power and substitute the other interface.

If troubles still persist, follow the self-loop procedures in the FIREBERD Operating Manual as an aid in localizing the problem. If the mainframe continues to be inoperative, refer to the following sections for service information, or call the TTC Customer Service Department for assistance.

5.3 SERVICE

5.3.1 Warranty Policy

All equipment manufactured by Telecommunications Techniques Corporation (TTC) is warranted against defects in material and workmanship. This warranty applies only to the original purchaser and is non-transferable unless express written authorization of the warranty transfer is granted by TTC.

Data interfaces, accessories, cables, breakout boxes, and all equipment (other than FIREBERD mainframes) will be repaired or replaced (at our option), at no charge, for a period of one (1) year after shipment to the customer.

Liability under this warranty extends only to the replacement value of the equipment. This warranty is void if:

(1) Equipment has been altered or repaired without specific written authorization from TTC.

(2) Equipment is installed or operated other than in accordance with instructions contained in TTC literature and operating manuals.

No other warranty is expressed or implied. TTC is not liable for consequential damages.

5.3.2 In-Warranty Service

Equipment in warranty must be returned to the factory with shipping prepaid. The equipment should be packed and shipped in accordance with the instructions in Section 5.3.4 of this manual. Before returning any equipment, the customer must obtain a Return Authorization (RA) number by contacting the TTC Repair Department. The RA number should be included on all paperwork and be clearly marked on the outside of the shipping container.

After the equipment is repaired by TTC, it will be tested to applicable specifications, burned-in for at least 24 hours, retested, and returned to the customer with shipping prepaid.

A brief description of the work performed and the materials used will be provided on the Equipment Repair Report that will be furnished with the returned equipment.

5.3.3 Out-of-Warranty Service

The procedure for repairing out-of-warranty equipment is the same as that used for equipment still in warranty. However, there is a minimum charge applied to each request for out-of-warranty service. The minimum charge guarantees the customer an estimate of the repair costs and is used as credit against actual materials and labor costs should the equipment be repaired. Contact the TTC Repair Department for specific information on the minimum out-of-warranty repair charge.

The customer will be billed for parts and standard labor rates in effect at the time of repair. The customer will also be required to furnish a purchase order number before repair work can be started. A hard copy of the purchase order must be received by TTC before the repaired equipment can be shipped to the customer. A description of the materials used will be provided in the Equipment Repair Report.

Once an out-of-warranty repair is made, the repaired part or component is warranted for 90 days. This warranty applies only to the part or component that was repaired; other parts or components are not covered under the 90-day repair warranty.

5.3.4 Equipment Return Instructions

To all equipment returned for repair, the customer should attach a tag that should include the following information:

(1) Owner's name and address.

(2) A list of equipment being returned and the corresponding serial number(s).

(3) A detailed description of the problem or of the service requested.

(4) The name and telephone number of the person to contact regarding questions concerning the repair(s).

(5) The Return Authorization (RA) number.

If possible, the customer should return the equipment in the original shipping container and material. If the original container is not available, the unit should be carefully packaged so that it will not be damaged in transit. TTC is not liable for any damage that occurs during shipment. The customer should clearly mark the TTC-issued RA number on the outside of the package and ship it prepaid and insured to TTC.

APPENDIX A

Table A-1
Revision F Remote Control Commands

The FIREBERD 6000 remote control commands supported by Revision F. software or lower are as follows:

Remote Command	Result
INT SET	Displays the active interface
INT SET 8MG703	Selects the G.703 8448 kb/s Framing Interface as the active interface
INT SET 8MG703 TIM XTA	Selects the interface crystal oscillator as the interface timing reference
INT SET 8MG703 TIM REC	Selects the recovered timing mode as the interface timing reference
INT SET 8MG703 MOD NOR	Selects the normal bit error detection mode
INT SET 8MG703 MOD BPV	Selects the HDB3 error detection mode
INT SET 8MG703 IMP TER	Selects the 75-ohm interface input impedance
INT SET 8MG703 IMP BRI	Selects the 1000-ohm interface input impedance

The INT SET commands provide full remote control of the 8448 kb/s G.703 Data Interface. The INT SET displays the currently selected data interface, but does not change the currently active interface in the FIREBERD mainframe. INT SET 8MG703 makes the 8448 kb/s G.703 Data Interface the active interface.

Telecommunications
Techniques
Corporation

A DYNATECH COMPANY

20410 Observation Drive
Germantown, Maryland 20876
(800) 638-2049 or (301) 353-1550
Fax.: (301) 353-0731